Fig. 12. *Sphærococcus obscuratus*, diagram of adult female.
Fig. 13. " antenna of adult female.
Fig. 14. " wrinkles and chitinous bands of abdomen of adult female.
Fig. 15. " larva.
Fig. 16. " antenna of larva.
Fig. 17. " gamasid mite parasite.

PLATE XXIII.

Fig. 1. *Icerya nudata*, adult female, side view.
Fig. 2. " adult female, dorsal view.
Fig. 3. " antenna of female.
Fig. 4. " foot of female.
Fig. 5. " diagram of larval spinnerets and marginal hairs.
Fig. 6. " antenna of larva.
Fig. 7. *Icerya rosæ*, var. *australis*, diagram of male larva.
Fig. 8. " antenna of male larva.
Fig. 9. " adult male.
Fig. 10. " abdominal extremity of male.
Fig. 11. " antenna of male.

ART. XXXIX.—*Contributions towards a Monograph of the* Aleurodidæ, *a Family of Hemiptera-Homoptera.*

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[*Read before the Wellington Philosophical Society, 26th February, 1896.*]

Plates XXIV.–XXXV.

THE attention of systematic entomologists has perhaps been less directed to the *Aleurodidæ* than to any other family of insects. The bibliography attached to this paper contains, indeed, a fair number of names, but the majority of these writers have either simply repeated the phrases of their predecessors, or made only quite trivial observations, or manifested but slight acquaintance with the family. The number of species reported is exceedingly small; and yet these insects are found in almost every country, and infest a great variety of plants, and it is certain that a little trouble on the part of collectors and observers would discover a large number of species now quite unknown. In this paper I shall include more than twenty forms which I believe to be new. These forms have come under my notice in connection with my studies of the homopterous family of the *Coccidæ*, most of them having been sent to me as specimens of that family. Were I able now to do any collecting myself in New Zealand (which unfortunately is not the case) I am sure that I could

increase the list of species even in this country; and it stands to reason that in other lands there must be many *Aleurodidæ* awaiting discovery. I do not hold the opinion that the interest attached to any order of insects is to be measured by the number of genera and species which it at present contains, any more than by the size and colours of the insects comprised in it. Possibly the publication of these notes may induce entomologists to devote more attention to these minute and interesting, and by no means unimportant, organisms.

At the outset I must say that I am conscious of what may perhaps be considered a serious defect in this paper. I mean that in the majority (indeed, nearly all) of the new species which are herein described and figured I have been unable to report anything concerning the adult stage of the insects. It may be thought that an account of the larvæ and pupæ, without a description of the imagines, is too imperfect for scientific completeness and accuracy, and is therefore of little use to science. Probably such a view might be correct as regards the greater number of insect orders, and I would myself admit its justice even as regards the *Coccidæ*, for in most cases a knowledge of the immature stages of insects is not much of a guide to their adult form. But in the *Aleurodidæ* the case is different; and I venture to put forward the following reasons for the proceeding which I have adopted:—

1. The *Aleurodidæ* differ but very slightly in their adult stage. The form of the body, of the feet and antennæ, of the rostrum, of the genitalia, is but little varied in this stage, and the differences which may exist require exceedingly minute observation for their detection. The presence or absence of spots on the elytra, and a very minute difference in the venation, are really about the only characters for differentiation.

2. But, on the other hand, the form of the larva and the pupa, their colours and markings, and their secretions, vary most considerably. A glance at the figures accompanying this paper will very readily exhibit this fact.

3. It is precisely in the larval and pupal states that these insects inflict injury upon plants. Although (differing in this from the *Coccidæ*) both sexes possess rostra and digestive organs in the adult state, yet it does not appear that in that condition they damage plants; that is done by the larvæ and pupæ. It appears, therefore, more important, in the domain at least of economic entomology, to bring out the differences in these immature stages, so that cultivators may recognise the insects in those stages in which they more particularly affect plants.

4. The point just mentioned has been probably the reason why most of the species which I have received have been sent to me as larvæ or pupæ. *Aleurodidæ* in these states are often

exceedingly like *Coccidæ*; so like that even an entomologist requires close examination to detect the differences. Gardeners, therefore, and collectors, and museum authorities, and others, not pretending to exact knowledge of the Homoptera, finding plants covered perhaps with a multitude of scale-like insects, and not connecting them with the little white flies hovering over the branches, send them for identification as *Coccidæ*, and it is almost impossible within reasonable time to procure from the collectors the adults, which, indeed, they can scarcely recognise.

5. Probably the best means by which one could arrive at some knowledge of the adults is the publication of such a paper as the present one as a guide to collectors.

The foregoing reasons seem to me sufficient to explain my motive in this paper.*

Bibliography.

The following list contains the names of all the authors who have treated of the *Aleurodidæ*, as far as I am aware, omitting such brief notices as may be found scattered in publications like the *Entomologist*, *Gardeners' Chronicle*, *Insect Life*, &c., not containing scientific descriptions or observations. With regard to the years 1894 and 1895, the information available to me is not yet complete. As regards early writers, such as Réaumur, Linnæus, Geoffroy, &c., it is to be noted that they class these insects under such varied genera as *Papilio*, *Tinea*, *Chermes*, &c.:—

1740 (about). *Réaumur*, Mémoires, tom. ii., mem. 7.
1764. *Geoffroy*, Hist. abr. des Insectes, p. 509.
1764–90. *Linnæus*, Syst. Nat.; and *Rœmer*, Notiz.
1795–1807. *Latreille*, Mag. Encycl., tom. ii., p. 304; and Genera Ins., tom. iii., p. 174.
1800–30. *Tigny*, *Walckenaer*, *Kirby and Spence*; observations of no special importance.
1801. *Schrank*, Fauna Boica, ii., 1, 147, 1273.
1829. *Stephens*, Catal. of Brit. Ins., p. 267.
1833. *Doubleday*, Entom. Mag., vol. i., p. 313.
1835. *Haliday*, Entom. Mag., vol. ii., p. 119.
1835. *Burmeister*, Handb. der Entom., tom. ii., p. 82.
1840–41. *Blanchard*, Ins. Voyage to Chili, p. 319.
1840. *Westwood*, Introd. to Mod. Class. of Ins., vol. ii., p. 442.

* In the *Entomologists' Monthly Magazine* for August, 1895, is an article by Mr. J. H. Durrant, F.E.S., entitled "A Protest against giving Names to the Preparatory Stages of Insects." Whatever may be the force of the argument therein as to the Lepidoptera, Diptera, Hymenoptera, and Coleoptera, I venture to think that an exception may be made as to the Homoptera.

1841. *Guérin*, Iconog. du Règne Anim., p. 373.
1843–48. *Amyot* and *Serville*, Hemipt., 614.
1840–43. *Boyer de Fonscolombe*, *Hartig*; unimportant observations.
1846. *Curtis*, Gard. Chronicle, p. 284.
1849. *Bärensprung*, Zeit. fur Zool., Alton und Burm., p. 176.
1850. *Haldeman*, Journ. Amer. Soc. Sci. and Arts, 2nd ser., p. 108.
1851. *Bouché*, Entom. Zeit. Stett., tom. xii., p. 108.
1851. *Walker*, Catal. Homopt. in Brit. Mus.
1855. *Hegeer (Heeger ?)*, Sitzungsber. der Akad. Wissensch., tom. xviii., 35; Beitrag zur Naturges. der Insekt., p. 3.
1856. *Westwood*, Gard. Chronicle, p. 852.
1857. *Koch*, Pflanzenläuse, p. 324.
1859. *Hegeer (Heeger ?)*, Beitrag zur Naturges. d. Ins., pp. 14, 111.
1863. *Gerstaecker*, Handb. des. Zool., tom. ii., p. 340.
1866–67. *Frauenfeld*, Verh. Zool.-Bot. Gesells., Wien, p. 793.
1867–68. *Signoret*, Ann. de la Soc. Entom. de France, p. 369.
1867. *Löw*, Verh. Zool.-Bot. Gesells., Wien, p. 746.
1878. *Douglas*, Ent. Mo. Mag., vol. xiv., p. 230.
1879. *Douglas*, Ent. Mo. Mag., vol. xvi., p. 43.
1880. *Douglas*, Ent. Mo. Mag. vol. xvii., p. 89.
1880. *Künow*, Entom. Nachricht., vi., p. 46.
(?) *Shimer*, Trans. Amer. Entom. Soc., i., p. 281.
1881. *Signoret*, Ann. de la Soc. Ent. de France, p. 158.
1883. *Signoret*, Ann. de la Soc. Ent. de France, p. 63.
1884. *Douglas*, Ent. Mo. Mag., vol. xx., p. 215.
1886. *Douglas*, Ent. Mo. Mag., vol. xxiii., p. 164.
1881–86. *Ormerod*, Injurious Insects; Reports, &c.
1886. *Westhoff*, Jahresber. Zool.-Westfäl.-Verein, p. 56.
1886. *Goldi*, Mittheil. Schweitz. Entom. Gesellsch., vii., p. 247.
1888. *Karsch*, Entom. Nachricht., xiv., p. 31.
1888. *Douglas*, Ent. Mo. Mag., vol. xxiv., p. 265.
1889. *Douglas*, Ent. Mo. Mag., vol. xxv., p. 256.
1889. *Maskell*, Trans. N.Z. Inst., vol. xxii., p. 171.
1891. *Douglas*, Ent. Mo. Mag., vol. xxvii., pp. 44, 322.
1892. *Douglas* and *Morgan*, Ent. Mo. Mag., vol. xxviii., p. 29.
1893. *Cockerell*, Ent. Mo. Mag., vol. xxix., p. 105.
1893. *Riley* and *Howard*, Insect Life, pp. 219, 314.
1894. *Douglas*, Ent. Mo. Mag., vol. xxx., pp. 40, 73, 154.

1895. *Douglas*, Ent. Mo. Mag., vol. xxxi., pp. 68, 97, 117.
1895. *Lewis*, Journ. Quekett Micr. Club, p. 88.

Mention must also be made of a paper by Dr. Signoret (Ann. de la Soc. Entom. de France, 1879), in which the author establishes a new genus *Spondyliaspis*, containing three species, from Queensland, Australia, which he proposes to attach to the *Aleurodidæ*. But there is no doubt that these insects belong to the family *Psyllidæ*, and are closely allied to some which are described by Dobson in the "Proceedings of the Royal Society of Tasmania," 1850 (vol. i., 1848–50, p. 235 *et seqq.*). Drawings of the waxy coverings of these insects and of pupæ sent to me by Dr. Signoret in 1882, and compared both with Mr. Dobson's figures and with actual specimens from Australia in my cabinet, satisfied me on this point, and Dr. Signoret subsequently agreed with me. In *Insect Life*, 1893, p. 219, Messrs. Riley and Howard say that *Spondyliaspis* was "afterwards found to fall before Maskell's *Inglina* [misprint for *Inglisia*], erroneously supposed by the latter to belong to the *Coccidæ*." There is not the slightest doubt that *Inglisia* is a Coccid, and it is not at all similar in any respect to *Spondyliaspis*. The sentence just quoted is regrettable.

Order HEMIPTERA.

Sub-order HOMOPTERA.

Family ALEURODIDÆ.

Insects infesting plants; furnished in the adult state with four wings in both sexes; possessing also in the adult state in both sexes rostra and digestive organs. Eyes sometimes entire, sometimes divided, but more usually reniform, with a larger and a smaller segment, of which the smaller is anterior; antennæ of seven joints; feet with dimerous tarsi terminated by three claws, of which one is smaller than the other two. Eggs with a short peduncle or stalk.

The wings of the adults are usually covered with more or less of a white powdery matter, from which the name of the family has been established (ἄλευρον = flour).

It has already been observed that there is little difference amongst the adults of this family, except as regards the wings, which in some species are immaculately white and in others more or less spotted, patched, or banded. The minute distinctions, which may be detected by close examination, in the relative lengths of the antennal joints or of the feet, or in the divisions of the eyes, seem to be unimportant; and the colours of the bodies, which vary somewhat with the age of the specimens, may perhaps be looked on as often subject to the

"personal equation" of an observer. Plates XXIV., 1, and XXIV., 2, of this paper are designed to show the details of structure which may be taken as sufficiently constant throughout the family, as far as the adults are concerned.

The adults may therefore be said to be practically always yellowish or tinged with red or brown; the wings carried flat when at rest and not extending much beyond the abdomen; forewings usually rounded, pure white or spotted, patched or banded with brown or red; hindwings smaller, also rounded; vein in the forewing single, median, with one basal branch (*Aleurodes*), or a basal and a terminal branch (*Aleurodicus*); vein of hindwing single, median, with one basal branch*; head small, transverse, oblique beneath, slightly convex above, anteriorly rounded; eyes two, red or brown, not prominent, more or less reniform or sometimes divided, the anterior portion the smallest; a small simple circular ocellus close to each eye; antennæ anterior to the eyes, consisting of seven joints, of which the two first are short and simple, the rest long, slender, and numerously ringed; rostrum projecting from the under-side of the head, composed of a single (?) conical joint, at the apex of which are three tubular setæ, and from the base of which (beneath) springs a long subcylindrical mentum, of three segments,† which is free in all its length, and frequently extends beyond the thorax; the tip of the mentum is usually dark-coloured; thorax short, the pro-, meso-, and meta-thorax about equal; abdomen moderate, roundly tapering, terminated by the genitalia, and bearing dorsally a minute tubercular organ‡ (described more particularly below) consisting of an orifice, an operculum, and a lingula; genitalia usually dark-coloured; genitalia of female conical or subconical; genitalia of male forcipate; feet slender, long, tarsi dimerous, terminal claws three, of which the middle one is the shortest.

The eggs, which are elliptical, pedunculated and usually yellow or orange in colour, are produced in great numbers, but seemingly only once in a year, although it would appear (according to Réaumur and Hegeer) that the period required for hatching is ten days or a fortnight.

The larva, as soon as it is hatched, fixes itself on the leaf, and, as a rule, never afterwards moves from its position. In

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* Signoret thinks that perhaps there may be two or three "invisible" veins in the forewing.

† Westwood (Introd. to Mod. Class. of Ins., vol. ii., p. 442) says, "promuscis 2-jointed"; but it seems clear that he did not distinguish the mentum. See his figure 118, 4.

‡ Westwood (*loc. cit.*) says, "Abdomen neither tubercled nor corniculate"; surely an error. He likewise says of the feet—"ungues two," but in his figure he shows three.

this stage the differentiation of species can be fairly commenced. In general form and outline there is little distinction, the larvæ being (as far as is at present known) always elliptical and flattish; but in the colours, in the character of the secretions and fringes, in the arrangement, or the absence of hairs, spines, pustules, or other features, it is possible to note clearly enough the specific differences, as will be seen from the descriptions and figures given in this paper. Generally, in the earliest form of the larva, it is simply a thin, flattish, elliptical, motionless object in which no trace of organs is visible with the exception of an orifice near one extremity, which in this paper I term the "vasiform orifice," and of which I shall speak more particularly presently. As the larva grows, indications of the rostrum appear, and still later rudiments of feet and antennæ may be faintly traced. According to the two authors mentioned above, the larva remains in this state only for about a fortnight, and then, without change of position or discarding of its envelope, passes into the pupa stage. This is the view adopted by most writers on the family, and it seems to be, as a general rule, correct; so that there is extreme difficulty in recognising, except perhaps by size, the difference between a late larva and a pupa, and most authors seem to speak indiscriminately of both, under the names of "early larva," "adult larva," "nymph," &c., these stages being apparently usually distinguished by the more or less definite outlines of the rudimentary feet and antennæ. In 1889 (Trans. N.Z. Inst., vol. xxii.) I pointed out that in *Aleurodes asplenii*, otherwise sufficiently normal as regards the question here referred to, it is possible to differentiate the larva from the pupa by reference to the secreted waxy fringes. Still, as a rule, it may, perhaps, be admitted that in this family the typical larva passes nearly imperceptibly into the pupa stage. But I am able in this paper to report some species (*e.g.*, *A. floccosa*, *A. piperis*, &c.) in which the larva is clearly distinct from the pupa, and in its metamorphosis discards its envelope, the exuviæ remaining attached to the pupa-case. In these species I am unable to detect any rudimentary organs in the larva.

It is possible that at a future time it may be thought necessary to create a new genus, or perhaps a sub-genus, for the species which thus depart from the usual rule. I report in this paper only four of these; but others may hereafter be found. However, at present I shall not separate them. In only one of the four (*A. piperis*) have I yet seen the adult form, and that does not seem to present any remarkable features.

The pupa-case, as remarked above, in the normal state

may be distinguished from the "late larva" principally by its size. But it happens not unfrequently that there are other characters which may be employed. Colour may be to some extent considered, and in many cases the pupæ can be recognised by their darker tinge. As a rule, also, the rudimentary feet and antennæ are in this stage much more distinctly visible, although sometimes (*e.g.*, *A. barodensis*, *A. limbata*, &c.) the very dark colour prevents this. Again, sometimes the fringes or hairs of the larva are absent from the pupa (*e.g.*, *A. asplenii*, *A. cotesii*), or the arrangement of the hairs or wax may differ (*e.g.*, *A. hirsuta*). On the whole, it is not difficult to decide whether a specimen is a larva or a pupa, though there are exceptions; of course, there can be no doubt in those cases where the larval exuviæ are seen on the dorsum of the pupa.

I may here remark, in passing, that, as far as my experience goes, the *Aleurodidæ* differ from other Homoptera in being always on the under-surface of leaves. *Coccidæ* and *Psyllidæ* are found indiscriminately on leaves or twigs, and often on both upper and lower surfaces of a leaf; but I have never seen an *Aleurodes* except on a leaf, on the lower side—I mean, of course, a larva or a pupa.

It remains to speak of an organ which is quite characteristic of this family, and which, more or less modified, is visible in every stage of growth after the egg. Viewing an Aleurodid larva or pupa with the naked eye, or with a lens of low magnifying-power, it is scarcely possible to distinguish it from a Coccid, especially of the section *Lecaninæ*, especially if, as sometimes happens (*e.g.*, *A. decipiens*), there is a cleft in the abdominal extremity. But on applying a greater magnifying-power it is observed that, whereas in a Lecanid there are two minute subconical lobes visible on the abdominal dorsum, there is seen in an Aleurodid a minute orifice, more or less elliptical or subconical posteriorly, and more or less depressed, or even slightly convex, anteriorly. This orifice is partially closed by a plate which is hinged on the anterior edge of the orifice, but does not extend altogether to the posterior edge. No author known to me has entered into any details regarding this organ; and yet, as it is persistent in one form or another from the earliest larval stage to the latest adult state, and is entirely characteristic of the family, it may be well to elucidate it as far as possible. Signoret merely remarks that in the adult there is on the last abdominal segment "a kind of elongated tubercle of varying shape, apparently allied to the cornicles of *Aphis*"; but he does not say anything about its presence in the earlier stages. I have not found any other author who pays particular attention to this organ except Mr. R. T. Lewis (Journ. of Quekett Micr. Club, 1895), who

mentions it, and gives figures of it on the adult only; and Mr. J. W. Douglas, who, in the *Entomologists' Monthly Magazine*, 1891, figures the organ on the pupa of *A. rubicola*.

I have in this paper noted carefully what seem to be specific variations in this organ, believing it to be quite a valid differentiating character. It consists of three parts. First, an orifice in the dorsal surface of the abdominal region, to which I have given the name of the "vasiform orifice," from its general outline. Secondly, a plate hinged upon the anterior edge of the orifice, which I call the "operculum," and which does not entirely cover the orifice. Thirdly, a more or less slender, subcylindrical, tongue-like tube, which I call the "lingula," and of which the length varies considerably, being sometimes shorter than the operculum (*A. fodiens*), sometimes very much longer (*A. decipiens*). In the adult stage the lingula, as a rule, does not project when at rest, the whole organ then appearing as a simple open tubercle on the abdominal dorsum; but in some species (*e.g.*, *A. asparagi*, and in all probability *A. decipiens*) it protrudes as a conspicuous cylindrical tongue. The lingula also very frequently bears some fine hairs or setæ, varying from extremely minute to considerably long ones.

I strongly incline to the belief that this organ is concerned with the secretion of "honeydew." The *Aleurodidæ* do not seem to produce this substance in such quantities as the *Coccidæ* and the *Aphididæ*, and the leaves which they attack are therefore usually less subject to be covered with black fungus than is the case with those families; but they do produce some. For example, Messrs. Riley and Howard, in *Insect Life*, 1893, p. 316, observe of *A. cocois*, "The upper surface (of a leaf) is frequently attacked by a smut-fungus which is developed on the honeydew thrown down from the under-sides of the leaves above. The honeydew attracts numerous ants." In my paper "On the Honeydew of *Coccidæ* and the Fungus accompanying these Insects" (Trans. N.Z. Inst., 1886, p. 41), I drew special attention to this secretion and to the blackening of the leaves by it, and I described and figured an organ which I had actually seen employed in the production of honeydew in the species *Ctenochiton elæocarpi*. That species belongs to the Coccid section *Lecaninæ*, and in that section, on the abdominal dorsum, there are always present two subtriangular projecting lobes, from between and beneath which the tubular organ just mentioned was protruded whilst I was watching the specimen. I am convinced that the "lingula" of *Aleurodes* is homologous with the honeydew organ of *Ctenochiton*, and that its function is the production of honeydew.

In a letter to me respecting *A. asparagi* Mr. Lewis tells

me that he is informed that "something analogous [to the lingula] is found in certain Coleoptera adjacent to the generative organs, and that they are regarded as of the nature of palpi." But I think that the explanation which has just been given will be nearer the truth.

As regards the waxy secretions of the *Aleurodidæ*, I may say that, in my experience, they never take the form of solid homogeneous plates, as in some *Coccidæ*. Often, when an *Aleurodes* pupa is lifted from a leaf, a ring of wax is left behind, and to the naked eye appears rather solid; but on close examination it is seen to be composed of adjacent tubes. The marginal fringes and dorsal wax of larvæ and pupæ are also not solid. On the other hand, I think they scarcely reach the same degree of fineness and "fluffiness" as the secretion, say, of some *Dactylopidæ* or *Acanthococcidæ*, which seems really like soft cotton. In chemical composition, doubtless, the secretion of an Aleurodid will not differ from that of a Coccid. Amongst the species described in this paper, *A. croccata* has the most solid-looking marginal wax; but even in that close observation will detect a tubular structure. This fact arises from the character of the margin in the larva and pupa. The figures which I give show that the margin is never quite entire, but presents a "crenulated" appearance, more or less conspicuous. The "crenulations" are merely the extremities of cylindrical tubes closely adjacent, each of which has the function of secreting wax, and this wax, therefore, necessarily preserves the form impressed upon it at its origin. It does not necessarily follow that a crenulated margin always carries a fringe; for example, *A. hirsuta* has deep crenulations but no fringe.

A curious illustration of my remark just now, that the *Aleurodidæ* affect only the under surfaces of leaves, and never (or scarcely ever) the upper surfaces, and therein differ from other Homoptera, has been furnished to me since this paper was written. Mr. C. Musson sent me, from the Kurrajong Hills, in New South Wales, some leaves of *Syncarpia laurifolia* which were covered with numbers of very deep pits on the upper surfaces, the other sides being pressed out into conspicuous elevations. Examining these with a lens, I found in each pit what seemed to be an Aleurodid pupa, looking dorsally very much like that of *A. melicyti*. When, however, I extracted one of these, I found that the rudimentary feet and antennæ were not enclosed in the pupa-case, but were very distinctly free and active (the ventral surface of the insect being exceedingly convex); and on examination, under the microscope, no trace appeared of any vasiform orifice. Further, the extremity of each foot was furnished with a fan-shaped pad beneath the two claws. It was clear, therefore, that I

had to do with a Psyllid, and not with an Aleurodid, a fact of which I had originally some suspicion when I saw the insects on the upper instead of the under surface of the leaf. But the very great dorsal similarity, at first sight, to an Aleurodid showed the necessity of much care before arriving at a decision.

A paper on *Aleurodidæ* would be incomplete without some notice of the means available for destroying these injurious insects, or at least minimising their effects. They are very closely allied to the *Coccidæ*, and derive their nourishment from plants in the same way—through their rostral tubes; and a similar mode of combatting them will be available for both families. The most successful plan will therefore be, as for *Coccidæ*, applications of kerosene emulsion in the form of spray. I see no reason why the formula used against Coccids should not be good against Aleurodids. That formula is as follows: Take of common soap, ½lb.; kerosene, 2 gallons; soft water, 1 gallon. First dissolve the soap in the water, heated to boiling, then add the kerosene, and churn the mixture until a creamy fluid results, which thickens on cooling. Dilute with nine or ten (or, for tender plants, twelve to fourteen) times the quantity of water. Apply in the form of the finest possible spray by using one of the different kinds of "cyclone" nozzle, in dry, and preferably cloudy, weather, repeating the dose after about ten days.

The foregoing formula was recommended by me several years ago in my "Scale-Insects of New Zealand," and I have not seen any reason since to change it.

The process just mentioned is intended for the larval and pupal states of *Aleurodidæ*, and will undoubtedly require some care on account of the habit (already noted) of these insects to attach themselves almost, if not quite, exclusively to the under-sides of leaves, where it is, of course, difficult to get at them. In the case of such trees as orange, or tall plants like sugar-cane, the trouble is less than with low-growing plants such as tomato, cabbage, or tobacco. Still, the spray may be made to reach even these satisfactorily.

When the Aleurodids are in their adult stage they may be treated like Aphides on roses or other plants, and tobacco-water, or soapsuds, or the well-known "Gishurst compound" may be used. If not over too large an area, advantage may be taken of their habit of rising on the wing in numbers when the plant is disturbed, and then after a few minutes settling again. While in the air they may be easily caught, sometimes in hundreds, in an ordinary entomological net, and destroyed.

Genus Aleurodes, Latreille.

Insects attacking plants, oviparous; metamorphosis incomplete; fixed in the earlier stages to leaves, free and active in the adult stage, when they usually have a habit of rising in a cloud when disturbed and settling again after a short time.

Adults of both sexes having four wings, which are usually floury, and may be immaculate or spotted or patched. Antennæ of seven joints. Eyes reniform (or more seldom divided), the anterior segment the smallest; two small simple ocelli between the eyes. Mouth-parts consisting of a conical or subconical protruding rostrum, at the end of which are three tubular suctorial setæ, and beneath the rostrum is an elongated subcylindrical free mentum; the mouth and digestive organs are present in both adult sexes. First two joints of the antennæ small and simple; remaining joints long, slender, and numerously ringed; the last joint terminates in two minute spines. Feet long and slender, none of the joints being much thickened; tibia usually about twice as long as the tarsus; tarsus two-jointed, ending with three claws, of which the median is small and spiny. Abdomen in both sexes bearing dorsally on the last segment a more or less tubercular (honeydew) organ composed of an orifice, an operculum, and a lingula; the lingula usually concealed, sometimes projecting. Genitalia terminal; genitalia of female conical, more or less acute, divided into two sections, between which is the ovipositor; genitalia of male forcipate, enclosing the penis. Wings exhibiting in each only a single median vein with one basal posterior branch; the wings are carried flat at rest.

Pupæ enclosed in more or less transparent chitinous cases of elliptical form, convex above, flat beneath. Rudimentary antennæ, feet, and wings enclosed, and in many cases visible through the case. Rostrum and setæ protruded. Pupa-case naked, or bearing hairs or spines, which may carry more or less of dorsal wax or meal; margin composed of adjacent tubes, from the ends of which may be produced a fringe of waxy threads, varying in length and in solidity; this fringe is sometimes replaced by a ring of wax more or less thick and elevated; sometimes the fringe is entirely absent. On the abdominal dorsum is an (honeydew) organ similar to that of the adult, but usually less tubercular; the lingula may protrude or be obsolete.

Larvæ elliptical, usually flat and thin; sometimes enclosed in chitinous cases, which are discarded on changing to the pupal state. Organs in the earliest stage not usually recognisable, but becoming faintly visible with the growth of the insect. Dorsal abdominal organ as in the pupa.

Eggs elliptical, with a short peduncle for attachment to the leaf.

The relationship between Aleurodes and a Coccid of the section *Lecaninæ*, or a Psyllid of the section *Triozinæ*, is very noticeable in the earlier states; and the principal character by which it can be distinguished is the vasiform orifice, which has its counterpart in a Lecanid in the abdominal lobes, and in a Triozid in the "anal ring" (see my paper on *Psyllidæ*, Trans. N.Z. Inst., 1889). Another, but less conspicuous, difference is in the feet: in a Lecanid there is but a single claw, and in a Psyllid the two claws have beneath them a fan-shaped pad. The adult Aleurodes differs from Coccids in the possession of four wings in both sexes, and from Psyllids in the single median vein of both wings.

For a reason of which I am not aware, the word "Aleurodes" has been treated by all authors as feminine. I have not thought it worth while to disturb the arrangement.

1. **Aleurodes abutilonea,** Haldeman. Journ. Amer. Soc. Sci. and Arts, 1850, 2nd ser., p. 108.

2. **Aleurodes aceris,** Geoffroy. *Chermes aceris ovatus*, Geoff., Hist. abr. des Insectes, 1764, p. 509; *Aleurodes aceris*, Bärensprung, Zeit. fur Zool. Alton und Burm., 1849, p. 176; Bouché, Entom. Zeit. Stett., 1851, p. 108; Frauenfeld, Verh. Zool.-Bot.-Gesellsch., Wien, 1866, p. 795; Signoret, Ann. de la Soc. Entom. de France, Dec., 1867, p. 394.

3. **Aleurodes aëpim,** Goldi. Mittheil. Schweitz. Entom.-Gesellsch., vii., 1886, p. 250.

4. **Aleurodes asparagi,** Lewis. Journ. Quek. Micr. Club, 1895, p. 88; Rep. Ealing Soc., 1893, p. 1.

5. **Aleurodes asplenii,** Maskell. Trans. N.Z. Inst., 1890, vol. xxii., p. 173.

Vasiform orifice subconical; operculum small; lingula moderate, clavate.

6. **Aleurodes avellanæ,** Signoret. Ann. de la Soc. Entom. de France, Dec., 1867, p. 385; Douglas, Ent. Mo. Mag., 1894, vol. xxx., p. 154.

7. **Aleurodes banksiæ,** Maskell, sp. nov. Plate XXV.—1.

Larva brown, elliptical; length about $\frac{1}{45}$in. Margin distinctly crenulated, but bearing no fringe. Abdominal segments fairly distinct. Dorsum bearing, within the margin, a row of longish, strong spines, of which four, on the anterior region, extend beyond the margin; also, on the anterior

thoracic region, six other spines in two rows; the extremities of all these spines are dilated into three minute spicules. Vasiform orifice with regularly convex sides and end, the anterior edge concave; operculum moderate, subcircular; lingula obsolete.

Pupa-case intense glossy black, flattish, elliptical; length about $\frac{1}{25}$in. Abdominal segments moderately distinct. Margin crenulated, but less conspicuously than in the larva; there is sometimes a small fragmentary waxy fringe. Dorsum bearing rows of short fine hairs in place of the strong spines of the larva.

Adult form unknown.

Hab. In Australia, on *Banksia integrifolia* and on *Callistemon linearis*. My specimens were sent from Melbourne by Mr. C. French.

8. **Aleurodes barodensis,** Maskell, sp. nov. Plate XXV.—2.

Eggs orange-coloured, rather large, oval, pedunculated; length about $\frac{1}{160}$in. The eggs and empty shells are found in large numbers on the leaf.

Larva dark-brown, becoming later almost black; elongated elliptical; slightly convex; abdominal segments fairly distinct; length about $\frac{1}{45}$in. Margin minutely crenulated, and bearing a short white waxy fringe, which is frequently very fragmentary or absent. Dorsum bearing, within the margin, a row of about thirty-two small simple circular pores; within these is a transverse row of four on the anterior thoracic region, another transverse row of four on the anterior abdominal region, a longitudinal row of four on each side of the abdomen, and one on each side of the vasiform orifice. Vasiform orifice subconical, the posterior extremity slightly produced; operculum short, rounded, subconical; lingula cylindrical at the base, afterwards widened, finally tapering, not quite reaching the edge of the orifice.

Pupa-case very dark-brown or glossy-black; very elongated, elliptical, with sides nearly straight, the width only about one-third of the length. Dorsum sometimes slightly convex, sometimes flat, sometimes slightly concave; abdominal segments indistinct. Vasiform orifice apparently as in the larva, but difficult to make out on account of the very dark colour of the case. Margin crenulated, and bearing a very elegant, long, snowy-white fringe of slender waxy cylindrical tubes. There is frequently some white powdery meal on the dorsum, which probably bears pores as in the larva, but it is most difficult to detect them. The ventral surface is flat, brown; the rudimentary organs are not distinct, owing to the dark colour.

Adult form unknown.

Hab. In India, on *Saccharum officinale*. My specimens were sent by Mr. Cotes, late of the Indian Museum, Calcutta, from Baroda. He informed me they were rather damaging to the sugar-cane in those parts.

The very elongated form is distinctive, besides the black colour.

9. **Aleurodes bergii,** Signoret. Ann. de la Soc. Entom. de France, Dec., 1867, p. 395.

10. **Aleurodes brassicæ,** Walker. Catal. of Homopt. in Brit. Mus., p. 1092; Koch, Pflanzenläuse, p. 326; Frauenfeld, Verh. Zool.-Bot.-Gesellsch, Wien, 1867, p. 794; Douglas, Ent. Mo. Mag., 1895, vol. xxxi., pp. 68, 97.

11. **Aleurodes capreæ,** Signoret. Ann. de la Soc. Entom. de France, Dec., 1867, p. 384.

12. **Aleurodes carpini,** Koch. Die Pflanzenläuse, Aphiden, 1857, p. 395; Signoret, Ann. de la Soc. Entom. de France, Dec., 1867, p. 382; Douglas, Ent. Mo. Mag., 1895, vol. xxxi., p. 117.

13. **Aleurodes cerata,** Maskell, sp. nov. Plate XXVI.—1.

Larva yellow, flattish, elliptical, with a slight constriction near the posterior extremity; length about $\frac{1}{27}$in. Dorsum hairless, but there are some scattered, extremely minute simple circular pores which produce a small quantity of white meal, and this sometimes rises into small lumps of felted threads. Margin thickened, formed of closely adjacent cylindrical tubes, the ends of which form minute crenulations, from which springs a fringe of moderately long white wax. Vasiform orifice subconical, with concave anterior edge and emarginate sides; operculum regularly subelliptical; lingula not quite reaching the end of the orifice.

Pupa-case orange-yellow; outline as in the larva, but rather more convex; length about $\frac{1}{20}$in. Dorsum hairless, but bearing many small simple circular pores, not set closely together: from these pores is produced a quantity of white wax much more plentiful and solid than in the larva; sometimes it forms only a thick, nearly homogeneous shell covering the insect; in other cases it is produced in several curling and irregular more or less cylindrical processes; in others again several pupæ are covered by one agglomerated mass. Margin as in the larva, and bearing a similar white fringe, amongst the tubes of which are some slender threads longer than the fringe. On turning over the pupa-case the rudimentary organs are clearly visible.

Adult form unknown.

Hab. In New Zealand, on *Fagus menziesii*. My specimens were sent by Mr. Raithby, from Reefton.

This handsome form may be easily mistaken for a Coccid. It is typical of the family in this respect: that the pupa is distinguishable from the larva principally by size and the larger quantity of waxy matter.

14. **Aleurodes citri,** Riley and Howard (Ashmead). *Insect Life*, 1893, p. 219.

15. **Aleurodes comata,** Maskell, sp. nov. Plate XXVI.—2.

Eggs yellowish-brown, elliptical; length about $\frac{1}{130}$in.; peduncle rather short.

Larva yellow; somewhat thick, flattish, regularly elliptical; length about $\frac{1}{55}$in. Dorsum bearing four longish fine hairs, of which two are on the cephalic region and two close to the vasiform orifice. Margin entire, not thickened, bearing a row of rather long, strong hairs, sixteen on each side, and two shorter ones at the abdominal extremity. Rudimentary eyes dark-red, tubercular, may be made out. Vasiform orifice broad, short, subelliptical; operculum short, transversely divided; lingula obsolete.

Pupa-case yellow; elliptical; length about $\frac{1}{25}$in. The dorsal four hairs as in the larva, and there is usually a small quantity of dorsal white meal. Abdominal segments indistinct. Margin with wide, shallow crenulations; marginal hairs as in the larva. Vasiform orifice, operculum, and lingula as in the larva. On turning over the pupa-case the rudimentary feet, antennæ, &c., are clearly visible.

Adult of general normal form; length of body about $\frac{1}{30}$in. Head and thorax dark-yellow. Abdomen lighter yellow. Genitalia brown. Wings narrow, grey; nervure straight; the basal branch very short, almost obsolete; margins of wings minutely serratulate, each serration bearing a minute spine; on the anterior edge of the hind-wing are four very fine hairs. The fore-wing bears four faint brownish patches difficult to distinguish; they form almost two transverse bands, but do not seem to meet at the nervure. Genitalia of male and female normal; each arm of the forceps of the male bears a few short hairs.

Hab. In Fiji, on a gramineous plant unknown to me. My specimens were sent by Mr. R. L. Holmes.

This species may be distinguished by the marginal and dorsal hairs of the larva and pupa. Something similar may be seen in *A. citri*, Riley and Howard, as figured in *Insect Life*, 1893, p. 219; but that species has four cephalic and four posterior long dorsal hairs; its wings are immaculate, and the adult male bears remarkable tufts of wax on the

abdomen; the serrations of the wing-margins are also different.

16. **Aleurodes corni**, Haldeman. Journ. Amer. Soc. Sci. and Arts, 1850, p. 108; Signoret, Ann. de la Soc. Ent. de France, Dec., 1867, p. 398.

17. **Aleurodes cotesii**, Maskell, sp. nov. Plate XXVII.—1.

Larva yellow, the median region darker than the margin; form elliptical; length about $\frac{1}{40}$in. In the earliest state only very faint indications of the insect itself appear, and the whole is very thin and flat; later on the enclosed future pupa begins to be visible, and the ventral surface becomes more convex; the eyes also appear. The larval integument becomes too small for the growing insect, and splits longitudinally; and in the early pupal state it may be seen attached along the dorsal edges of the pupa-case. Margins somewhat thickened, the adjacent tubes forming minute crenulations, and within it the dorsum bears numbers of very small circular pores; from these and from the marginal tubes is produced a quantity of white waxy matter, some of which covers the dorsum in scattered patches, and the rest spreads out round the larva in a very long fringe of delicate threads, frequently much longer than the insect itself. This waxy matter is very brittle, and, as a rule, the whole surface of a leaf is powdered over with the fragments, making the leaf look as if mildewed.

Pupa-case, in the earliest state, scarcely distinguishable from the late larva; afterwards, as the insect grows, it becomes much thicker. The form remains elliptical; the length reaches about $\frac{1}{30}$in. The dorsal disk is slightly convex, flattened towards the margin; it is larger than the ventral disk, and slightly overlaps the sides, which are vertical. The hollow thus formed is covered by a ring of thin white wax, and there is also a plate of wax beneath the ventral surface; portions of this ring and of the plate are frequently seen amongst the long threads of the larva. The pupal margin is crenulated, but bears no fringe, and the dorsum has no pores or wax. The outline of the enclosed pupa may be made out indistinctly on the dorsum, and the rudimentary organs ventrally on turning over the case. Vasiform orifice subconical, with regularly convex sides, the anterior edge concave; operculum subelliptical; lingula very short, not extending beyond the operculum.

Adult form unknown.

Hab. In India, on *Rosa*. My specimens were sent by Mr. Cotes, late of the Indian Museum, Calcutta. They came from Quetta, Beluchistan. I have named the species after him.

The overlapping of the sides by the dorsal disk of *A. cotesii*

is found also in a New Zealand species, *A. fagi*, Maskell, 1889; but that insect has no fringe, and the margin bears twenty-four hairs.

18. **Aleurodes croceata**, Maskell, sp. nov. Plate XXVII.—2.

Larva light-brown, thin, flattish, elliptical; length about $\frac{1}{50}$in. Dorsum bearing two spines on a level with the rostrum, but no others, nor any hairs. Margin deeply crenulated, truncate at the posterior extremity, where there are two rather long setæ. Fringe absent, or very fragmentary.

Pupa-case dull-black, elliptical; dorsum convex; length about $\frac{1}{24}$in.; abdominal segments fairly distinct. Dorsum apparently without hairs or spines. Margins deeply crenulated, and surrounded by a mass of yellow wax, which is composed of slender tubes so closely adjacent as to be almost homogeneous; this fringe is not flat, but has the internal edge elevated, so that the pupa-case looks raised up on a sloping yellow ring. Vasiform orifice small, subconical, with a very convex anterior edge; operculum nearly covering the orifice; lingula short, subcylindrical.

Adult form unknown.

Hab. In Australia, on *Styphelia (Monotoca) elliptica*. My specimens were sent by Mr. Froggatt, from Botany, near Sydney.

The sloping yellow waxy ring will readily distinguish this species in the pupal state. This ring is so nearly homogeneous that it looks quite glassy and solid.

19. **Aleurodes decipiens**, Maskell, sp. nov. Plate XXVIII.—1.

Larva yellow, with often a pinkish tinge; elongated elliptical, the width about two-fifths of the length; dorsum slightly convex; length about $\frac{1}{18}$in. Faint indications of the future pupa may be discerned. Dorsum hairless, but covered with great numbers of rather conspicuous though not much elevated pustules, which are larger towards the margin than on the median region. Margin slightly thickened, composed of adjacent tubes whose ends form crenulations, from which spring short curling cylinders of wax usually not set closely together. Abdomen distinctly cleft from the vasiform orifice to the posterior margin, where there is a short seta on each side of the cleft. Vasiform orifice conical, very much elongated, the anterior edge concave, sides emarginate, nearly one-half the length of the cleft; operculum subcircular; lingula excessively long, but not extending beyond the orifice, cylindrical at the base, then somewhat dilated, then tapering to a point where there are two rather long setæ; the dilated portion of the lingula is covered with very minute dots, which may perhaps be fine hairs.

Pupa-case not observed with certainty, but amongst several larvæ on the leaves sent there is one pupa which may possibly belong to this species. It is yellow, elliptical, flattish; length about $\frac{1}{12}$in.; margin and marginal cylinders as in the larva. Dorsum covered with great numbers of pustules, smaller and less conspicuous than those of the larva, and bearing also six short spiny hairs, one on each side of the rostral region, one on each side of the thoracic region, and one on each side of the vasiform orifice; also eight transverse rows of minute circular pores on the cephalic and thoracic regions. The abdomen is distinctly cleft, and there are two short setæ at the posterior extremity. But the vasiform orifice differs from that described above: it is subcircular, with a concave anterior edge; operculum rhomboidal; lingula very short, not extending beyond the operculum. The rudimentary antennæ and feet may be made out with moderate clearness.

Adult form unknown.

Hab. In Australia, on *Styphelia (Monotoca) elliptica*. My specimens were sent by Mr. Froggatt, from Botany, near Sydney, in company with *A. croceata*.

The principal feature of the larva of this species is its remarkable resemblance to a Coccid of the section *Lecaninæ*. At first sight the abdominal cleft seems to point directly to a Lecanium, and the characters of the dorsum and the margin might also be Lecanid; but an examination of the very peculiar vasiform orifice and its lingula shows that it is clearly Aleurodid. I have thought it well to indicate by the specific name the deceptive nature of the general appearance. If the pupa above described belongs to *A. decipiens*, it will be exceptional from being smaller than the larva; as for the differences in the dorsal hairs and vasiform orifice, they may be unimportant.

20. **Aleurodes dubia**, Hegeer. Beitrag zur Naturges. der Ins., 1859, p. 14; Signoret, Ann. de la Soc. Entom. de France, Dec., 1867, p. 392.

21. **Aleurodes erigerontis**, Maskell, sp. nov. Plate XXVIII.—2.

Larva not observed.

Pupa-case pale-yellow, flattish, elliptical; length about $\frac{1}{45}$in. Abdominal segments moderately distinct. The enclosed pupa is brownish, and faintly discernible dorsally; on turning over the case the rudimentary feet and antennæ may be made out, but confusedly. Margin composed of slender tubes, giving it a fluted appearance, their ends forming minute crenulations; it bears a short fringe of white, straight cylinders of wax, which is frequently very fragmentary. Dorsum hairless, but exhibiting within the margin a row all round of

small tubercular papillæ, set rather closely together; from these spring moderately long, curling, white waxy cylinders, which are extremely brittle, and therefore frequently broken off. Within this series the dorsum has eight large circular orifices, two on the cephalic, four on the thoracic, and two on the abdominal regions. Vasiform orifice elongated, conical, with emarginate sides, and a deeply bifid apex; operculum elongated, conical, with emarginate sides, and end rounded; lingula moderate, extending a little beyond the operculum, its outer end clavate and emarginate. Eyes red, reniform; after treatment with reagents they appear fluted at the base.

Adult form unknown.

Hab. In Mexico, on *Erigeron* sp. My specimens were sent by Mr. T. D. A. Cockerell.

This species is closely allied to *A. nicotianæ*, described below; but differs in the number and arrangement of the large dorsal orifices, in the vasiform orifice, and in the absence of lateral depressions.

22. **Aleurodes eugeniæ**, Maskell, sp. nov. Plate XXIX.—1.

Larva dull-white or grey, or slightly yellowish; form roundly elliptical, the anterior edge very slightly compressed; dorsum scarcely convex; length about $\frac{1}{40}$in. Dorsum marked with very delicate radiating striæ. Margin without either fringe or hairs, and not at all thickened, but finely fluted and minutely crenulated. Three marginal depressions and radiating dorsal patches as described below in the pupa.

Pupa-case very pale yellow, or greyish; dorsum very slightly convex; form roundly elliptical or subcircular; length about $\frac{1}{20}$in. as a rule, but reaching $\frac{1}{15}$in. The enclosed pupa is conspicuous dorsally, dark-brown, the segments fairly distinct; on turning over the case the rudimentary feet may be made out rather confusedly, and the antennæ more faintly. Dorsum of the case marked with radiating striæ, more clear than those of the larva: these striæ are most conspicuous near the margin, which is not at all thickened, nearly entire, but marked with narrow but deep channels dividing it into broad segments. At three points in the margin there are small concave depressions, one at each side opposite the rostrum, and one at the abdominal extremity. Corresponding with these, on the dorsum, are three very faint radiating dotted patches: when viewed by transmitted light, these patches are seen to be formed of a lace-like pattern, with small irregular cells, and at their extremity they end in a circular orifice deeply crenulated; the anterior pair extend from the rostrum to the margin, the posterior one from the vasiform orifice to the margin. Vasiform orifice with straight anterior edge, sides and end regularly convex; operculum

nearly covering the orifice, and of similar form; lingula short, almost regularly cylindrical, scarcely extending beyond the operculum. There is no marginal fringe, nor are there any dorsal or marginal hairs.

Adult form unknown.

Hab. In India, on *Eugenia jambolana*. My specimens were sent by Dr. Alcock, Superintendent of the Indian Museum, Calcutta. From the great numbers on the leaves it would seem that the insect is injurious. They came from Poona.

A short description of this insect was sent by me to Dr. Alcock for insertion in "Indian Museum Notes": but I have included it again here in order to note the distinctions which separate it, firstly from *A. eugeniæ*, var. *aurantii*, next described, and secondly from *A. citri* (Ashmead), Riley and Howard, *Insect Life*, 1893, p. 219. As to the first, my descriptions and figures will suffice. From *A. citri* the species differs in the entire absence of marginal and dorsal hairs in the larva and in the three radiating lace-work patches, of which no mention is made by Riley and Howard, but which are conspicuous characters of *A. eugeniæ*.

This insect and its variety, with *A. citri*, *A. melicyti*, and others, may be placed in a series of which *A. proletella*, Linn., may be taken as the type.

23. **Aleurodes eugeniæ**, Maskell, var. *aurantii*, var. nov. Plate XXIX.—2.

Larva very pale-yellow, sometimes almost white; form roundly elliptical, flattish; length about $\frac{1}{40}$in. Dorsum striated, but the striations are very faint, except near the margin. Margin not at all thickened, finely fluted and crenulated, bearing no hairs or fringe. There are three small marginal depressions and three dorsal patches, as in the pupa.

Pupa-case very pale-yellow, roundly elliptical or subcircular, flattish and thin; length about $\frac{1}{24}$in., reaching sometimes as much as $\frac{1}{16}$in. The enclosed pupa is only faintly discernible dorsally, rather darker than the case, the abdominal segments moderately distinct; on turning over the case the rudimentary organs are less confused than in *A. eugeniæ*. Dorsum of the case very finely marked with radiating striæ, which are a little more conspicuous near the margin. Margin not thickened, almost entire, divided by deep narrow channels into segments narrower than those of *A. eugeniæ*. There are three marginal depressions, two opposite the rostrum and one at the abdominal extremity, and three radiating patches terminating at these depressions; the patches end (as in the type) in crenulated circular orifices, but are composed of great numbers of very minute circular pores or dots, which do not form a lace-work pattern. Vasiform orifice subtrapezoidal or

subelliptical, broader than long; operculum nearly fitting the orifice; lingula very short, cylindrical with a dilated end, sometimes obsolete.

Adult form unknown.

Hab. In India, on *Citrus aurantium*. Mr. Cotes, late of the Indian Museum, Calcutta, sent me some orange-leaves from "North-west Himalayas," thickly covered with this insect.

I attach this as a variety to *A. eugeniæ* on account of the similarity in several respects, notably in the dorsal radiating patches, though it differs in some others. It has none of the marginal or dorsal characters of *A. citri*, Riley and Howard.

24. **Aleurodes fagi,** Maskell. Trans. N.Z. Inst., 1889, vol. xxii., p. 175.

25. **Aleurodes filicum,** Goldi. Mittheil. Schweitz. Entom. Gesellsch., 1886, p. 247; Douglas, Ent. Mo. Mag., 1891, p. 44.

26. **Aleurodes floccosa,** Maskell, sp. nov., Plate XXX.—1.

Larvæ and pupæ covered, either singly or in colonies, with more or less of white flocculent matter.

Larva dull-yellow, elongated elliptical; dorsum very slightly convex; length about $\frac{1}{65}$in. The tubes of the margin end in very minute crenulations, and bear a white, almost always very fragmentary, waxy fringe. The dorsum bears eight strong spines in pairs; the three pairs on the cephalic, thoracic, and anterior abdominal regions are rather broadly lanceolate; the pair close to the vasiform orifice are cylindrical. The larval exuviæ are found, as described below, attached to the pupa-case.

Pupa-case dull-yellow, elliptical; dorsum slightly convex; the enclosed pupa brownish, moderately distinct; length about $\frac{1}{45}$in. to $\frac{1}{30}$in.; the median region over the pupa is more convex than the margins. Margin composed of adjacent tubes forming conspicuous crenulations, which bear, besides the flocculent matter, a moderately long fringe of straight white waxy tubes. Dorsum bearing six long slender spines in pairs; one pair is on the thoracic region, another pair close to the vasiform orifice, and a third pair near the abdominal extremity; this last pair frequently bear a pencil of white wax (as shown in my figure). These spines are not lanceolate but cylindrical, with tubercular bases. The larval exuviæ seem to be attached to the pupal dorsum by the two thoracic long spines, and as the larval and pupal colours are the same it is easy to mistake the lanceolate larval spines as belonging to the pupa.

Vasiform orifice twice as broad as long, anterior edge concave, posterior edge nearly straight, sides rounded; operculum short, broad, subelliptical; lingula obsolete.

Adult form unknown.

Hab. In Jamaica, on *Lignum vitæ*, in company with *A. stellata* (described below), which is frequently seen entangled in the flocculent mass of *A. floccosa*. My specimens were sent by Mr. Cockerell.

The dorsal spines (differing in the larva and the pupa) will distinguish this species. Perhaps, when the adult is known, the insect may be found to be an *Aleurodicus*, in which genus *A. anonæ*, Morgan, and *A. cocois*, Curtis (also West Indian species), produce masses of flocculent matter. Clearly, however, the organs which I have described separate *A. floccosa* from these two; and I find no mention anywhere of the carrying in them of the larval exuviæ on the pupal dorsum, surely an important character.

27. **Aleurodes fodiens**, Maskell, sp. nov. Plate XXX.—2.

Larva dull-yellow, flat, elliptical; length about $\frac{1}{50}$in. Dorsum faintly striated transversely. Margin very minutely crenulated, and bearing no fringe or hairs.

Pupa-case dull-yellow, flat, almost circular; diameter about $\frac{1}{37}$in. Enclosed pupa clearly discernible, of a darker colour than the case; abdominal segments distinct. The case is marked with radiating striæ, but there are no tubercles, hairs, or pores, nor any radiating patches. Margin slightly thickened, almost entire; no marginal hairs or fringe. Vasiform orifice subconical, anterior edge slightly concave, sides rounded, apex a little produced; operculum subtrapezoidal, covering about half the orifice; lingula very short, not extending beyond the operculum, frequently obsolete. On turning over the case the rudimentary feet and antennæ are clearly visible: in a late stage the eyes also become very distinct. The pupæ excavate rather deep pits in the surface of the leaf, on the under-side, just large enough to hold the case; on the upper side of the leaf there is a corresponding elevation.

Adult form unknown.

Hab. In New Zealand, on *Drimys axillaris*. My specimens were sent by Mr. R. Raithby, from Reefton.

The formation of pits in the leaf is characteristic of this species. In this proceeding it resembles the Coccid insect, *Rhizococcus fossor*, Maskell, 1883, which acts in a similar manner on *Santalum cunninghamii*; and the Aleurodes may very easily be mistaken at first sight for a Coccid. I have no idea of the manner in which this excavation is performed, or of the organs which may be employed in it. I have remarked on this point frequently in my papers on *Coccidæ* when refer-

ring to several species of that family which burrow more or less deeply into leaves or twigs.

28. **Aleurodes fragariæ**, Walker. List of Homopt. in Brit Mus., 1851, 1092; Signoret, Ann. de la Soc. Ent. de France, Dec., 1867, p. 383.

29. **Aleurodes fraxini**, Signoret. Ann. de la Soc. Ent. de France, 1867, p. 386.

30. **Aleurodes goyabæ**, Goldi. Mittheil. Schweitz. Entom. Gesellsch., 1886, vii., p. 248.

31. **Aleurodes hirsuta**, Maskell, sp. nov. Plate XXXI.—1.

Larva pale-yellow, very thin and flat, elliptical; length about $\frac{1}{45}$in. Dorsum bearing about twenty-eight rather long slender spines, which may be considered as arranged in two series, one submarginal, the other median; the extremities of these spines are dilated, and bear three very minute spicules. Margin distinctly crenulated, but the tubes are very indistinct; there is no fringe; there are three small marginal depressions, one on each side opposite the rostrum, and one at the abdominal extremity.

Pupa-case pale-yellow; elliptical, the cephalic region somewhat acuminate; length about $\frac{1}{20}$in. The marginal region is flat and thin, the portion covering the pupa considerably convex; the enclosed pupa is clearly visible. The margin is as in the larva, with three depressions; there is no fringe. The dorsum bears, just within the margin, a series of very long slender cylindrical spines, forty-eight in all; there is a second series of about sixteen (eight on each side) following the base of the median convexity; and a third of six or eight on the median region; the ends of most of these spines are dilated as in the larva. Vasiform orifice roundly subconical, with slightly concave anterior edge; operculum similar, nearly covering the orifice; lingula apparently obsolete. Rudimentary feet and antennæ indistinct.

Adult form unknown.

Hab. In Australia, on *Acacia longifolia*. Specimens sent by Mr. Froggatt, from Sydney.

This species seems to approach *A. phillyrea*, Haliday (Entom. Mag., 1835, p. 119), but differs in the absence of a waxy fringe, and in the arrangement and the length of the dorsal spines. Signoret (Ann. de la Soc. Ent. de France, Dec., 1867, p. 389) says of *A. phillyrea* that the "tubes of the fringe are so conspicuous as to make it difficult to see the spines, and it is only with a good light that these can be made out." This is certainly not the case with *A. hirsuta*.

32. **Aleurodes holmesii,** Maskell, sp. nov. Plate XXXI.—2.

Larva dull-yellow, elliptical, flattish; length about $\frac{1}{80}$in. Margin thickened, almost entire, the crenulations being very minute and confused. Dorsum bearing, on the thoracic region, six strong rather short spines; of these, two are median, the four others submarginal. In the earliest state there is no fringe, but in the latest stage there is a fragmentary short fringe of white wax.

Pupa-case dull-yellow, rather lighter coloured than the larva; form elliptical, flattish, and rather thick; length about $\frac{1}{25}$in. Abdominal segments moderately distinct. Dorsum bearing a submarginal series of strong short spines; two of these on the cephalic region and four on the posterior abdominal region are large and conspicuous, the other eight (four on each side), on the thoracic region, are smaller. From these spines is produced a quantity of white waxy secretion, which is very fragmentary, often entirely absent; it scarcely ever seems to completely cover the dorsum. Margin very distinctly and conspicuously crenulated with large thick segments; these produce a fringe of closely-adjacent waxy tubes, which at first is flat, then becomes a rather thick ring or cushion, and at last becomes so thick as to raise the pupa somewhat high above the leaf, and then it seems as if resting on a very elegantly-fluted white wall; vasiform orifice subelliptical, with concave anterior edge and broadly-rounded sides and end; operculum broad and short, the posterior edge concave; lingula very long, extended beyond the orifice, subcylindrical, with emarginate sides and compressed extremity, the end rugose, with four rather long and many very short setæ or hairs.

Adult form unknown.

Hab. In Fiji, on *Psidium* sp. My specimens were sent by Mr. R. L. Holmes.

The arrangement of the dorsal spines, and the peculiar lingula, will distinguish this species.

33. **Aleurodes immaculata,** Hegeer. Beitrag zur Naturges. der Insekt., 1855, p. 3; Signoret, Ann. de la Soc. Ent. de France, Dec., 1867, p. 390; Douglas, Ent. Mo. Mag., 1884, p. 215.

34. **Aleurodes jelinekii,** Frauenfeld. Verh. der Zool.-Bot. Gesellsch., Wien, 1867, p. 799; Signoret, Ann. de la Soc. Entom. de France, Dec., 1867, p. 393.

35. **Aleurodes lacerdæ,** Signoret. Ann. de la Soc. Entom. de France, 1883, p. 63.

36. **Aleurodes lauri,** Signoret. Ann. de la Soc. Entom. de France, 1883, p. 68.

37. **Aleurodes limbata**, Maskell, sp. nov. Plate XXXII.—1.

Larva dark-brown, flat, elliptical; length about $\frac{1}{70}$in. Dorsum hairless. Margin crenulated, but without fringe.

Pupa-case very dark-brown, or intense black, with the marginal region lighter coloured; form elliptical; dorsum convex; abdominal segments indistinct; length about $\frac{1}{35}$in. There appear to be no dorsal hairs, but there are two spines, rather long, on the thoracic region. Marginal tubes ending in large and conspicuous crenulations, from which springs a very long fringe of white wax; the portion of the fringe nearest the case is reticulated, or lace-like; the outer portion extended in long, slender, separate, wavy threads. Vasiform orifice elongated, subconical, with nearly straight anterior edge; operculum about two-thirds as large; lingula not certainly observed, but probably very short, if not obsolete. The larval exuviæ are commonly attached to the pupa-case by the two long dorsal spines.

Adult form unknown.

Hab. In Australia. Specimens were sent by Mr. Froggatt on *Acacia longifolia*, from Sydney; and by Mr. C. Musson, on *Leucopogon juniperinus*, from Kurrajong Heights.

The lace-like arrangement of the fringe and the attachment of the larval exuviæ to the pupa-case may be used together to distinguish this species.

38. **Aleurodes loniceræ**, Walker. Catal. of Homopt. in Brit. Mus., 1851, p. 1092; Koch, Pflanzenläuse, 1857, p. 327; Frauenfeld, Verh. der Zool.-Bot. Gesellsch., Wien, 1867, p. 796; Signoret, Ann. de la Soc. Ent. de France, Dec., 1867, p 381; Douglas, Ent. Mo. Mag., Feb., 1896, p. 31.

39. **Aleurodes melicyti**, Maskell. Trans. N.Z. Inst., 1889, vol. xxii., p. 174.

Vasiform orifice elongate, subconical, anterior edge slightly concave; operculum subsemicircular, small; lingula extending a little beyond the operculum, subcylindrical, the median part compressed, then rather dilated.

The orifice and lingula approach those of *A. rubicola*, Douglas (Ent. Mo. Mag., 1891, p. 322, fig. 5), but the pupa differs considerably in many particulars.

40. **Aleurodes nicotianæ**, Maskell, sp. nov. Plate XXXII.—2.

Larva pale-yellow, very thin, flat, subelliptical, with a depression on each side on the thoracic region, the abdomen tapering to the posterior extremity, where there are two rather long setæ; length about $\frac{1}{80}$in. Dorsum hairless. Margin not thickened, minutely crenulated; there is no fringe, but a few scattered very fine marginal hairs.

Pupa-case yellow, the median region darkening as the pupa approaches its metamorphosis; form elliptical, with four lateral depressions, two on each side (similar to those in the Coccid genus *Lecanium*); length about $\frac{1}{34}$in. Dorsum hairless, but bearing, just within the margin, a series of rather large tubercular pustules, subconical with an apical orifice, set somewhat closely together; and from each of these springs a curling, white, cylindrical waxy tube extending beyond the margin: within this series are twelve other pustules—one, large, on each side of the cephalic region; one, large, on each side of the thoracic region; two, large, on each side of the anterior abdominal region; one, large, on each side close to the posterior extremity; and one, small, on each side of the vasiform orifice. From these last series of dorsal pustules exudes a thin, yellow, waxy matter, which seems to be very brittle, as it is generally only fragmentary. Margin slightly thickened, composed of slender closely-adjacent tubes; there is only a very short fragmentary waxy fringe, although, as the dorsal waxy tubes extend beyond the margin, the case seems at first sight to be fringed; at the posterior extremity there are two setæ. Vasiform orifice sub-semi-elliptical, the anterior edge straight; operculum similar, but about half the size; lingula extending a little beyond the operculum, the extremity clavate, with two grooves.

Adult form unknown.

Hab. In Mexico, on *Nicotiana tabacum*. My specimens were sent by Mr. Cockerell, from Guanajuato. I am not sure whether the occurrence of an insect of the order Homoptera on tobacco is exceptional or not. Some time ago I remember an instance of tobacco in the Customhouse at Wellington being found to be infested by a species of weevil which did much damage to the article; but the living plant, as far as I know, is usually free from pests.

This species is nearly allied to *A. erigerontis* (*ante*), but differs in the vasiform orifice, in the arrangement of the dorsal pustules, and in the lateral depressions.

41. **Aleurodes niger,** Maskell, sp. nov. Plate XXXIII.—1.

Larva not observed.

Pupa-case at first flattish, but later very convex; form regularly elliptical; length about $\frac{1}{16}$in.; colour very dense dull-black. Dorsum minutely striated; abdominal segments fairly distinct; there are no dorsal hairs or spines. Margins very indistinctly crenulated, the crenulations very wide and shallow; there is no fringe. Vasiform orifice small, semi-elliptical; operculum covering about half the orifice; lingula not observed with certainty, probably obsolete.

Adult form unknown.

Hab. In Australia, on *Acacia pycnantha*. My specimens were sent by Mr. French, from Melbourne.

It is possible that this may be only a larger form of *A. banksiæ* (*ante*), but the colour is much less glossy, and the margin differs slightly.

42. **Aleurodes papillifer,** Maskell. Trans. N.Z. Inst., 1889, vol. xxii., p. 173.

Vasiform orifice semi-elliptical; operculum small; lingula broadly clavate.

43. **Aleurodes phalænoides,** Blanchard. Insect. Voy. du Chili, de Gay, 1840, p. 319; Signoret, Ann. de la Soc. Ent. de France, Dec., 1867, p. 399.

44. **Aleurodes phillyrea,** Haliday. Entom. Magaz., 1835, p. 119; Bouché, Entom. Zeit. Stett., 1851, p. 108; Signoret, Ann. de la Soc. Ent. de France, Dec., 1867, p. 388.

45. **Aleurodes piperis,** Maskell, sp. nov. Plate XXXIII.—2.

Eggs dark-yellow, elongate-elliptical, transversely striated; length about $\frac{1}{145}$in.

Larva very dark-brown or black, very slightly convex, elliptical; length about $\frac{1}{40}$in. Dorsum bearing long, very black spines, of which four are on the cephalic, eight on the thoracic, and ten on the abdominal regions. Margin not thickened, but very distinctly crenulated. There seems to be no fringe.

Pupa-case intense glossy black, slightly convex, with a median longitudinal ridge; abdominal segments indistinct. Form elliptical; length about $\frac{1}{25}$in. Dorsum bearing many long black spines, of which one series of from twenty to twenty-four are submarginal, the others scattered (seemingly about twenty, but very difficult to make out on account of the intense black colour); two of the spines, at the posterior extremity, are longer than the others. Margin with very small crenulations; there is a very short fringe of white wax, which in many specimens is not noticeable. Vasiform orifice broadly rhomboidal with rounded angles, anterior edge slightly concave; operculum semi-elliptical, covering about half the orifice; lingula short, roundly clavate. The larval exuviæ are commonly seen attached by the dorsal spines to the pupa-case.

The pupa extracted from its case is reddish-yellow, the rudimentary feet and antennæ yellow, the rudimentary wings yellow with bands of dark-brown, the eyes dark-brown.

Adult form with the thorax red, banded with brown; the abdomen red; genitalia brown; feet and antennæ darkish-

yellow, tipped with brown. The antennæ and feet are normal. Forewings with three bands of dark-brown, of which the outer one does not quite reach the margin at the extremity. The genitalia do not exhibit any special features.

Hab. In Ceylon, on *Piper* (*nigrum ?*). My specimens were sent by Mr. E. E. Green, from Punduloya.

I know of no described species in which the larva and pupa have such strong black spines as this. The wings of the adult are not particularly distinctive, for those of *A. sacchari*. Mask., 1889, have quite similar bands. I have found it extremely difficult to correctly distinguish the dorsal spines on the pupa; and the vasiform orifice also presents much difficulty.

46. **Aleurodes prenanthis,** Schrank. Fauna Boica, 1801, ii., 147; Signoret, Ann. de la Soc. Ent. de France, Dec., 1867, p. 399.

47. **Aleurodes proletella,** Linnæus; *A. chelidonii,* Latreille. Linn. Syst. Nat., p. —; Latreille, Mag. Encycl., ii., p. 304; Réaumur, Mém., vii.; Westwood, Introd. to Mod, Class. of Ins., vol. ii., p. 443; Koch, Pflanzenläuse, 1857; Frauenfeld, Verh. der Zool.-Bot. Gesellsch., Wien, 1867; Signoret, Ann. de la Soc. Ent. de France, Dec., 1867, p. 378; Douglas, Ent. Mo. Mag., 1894, p. 40; *ib.*, 1895, p. 68.

48. **Aleurodes pulvinata,** Maskell, sp. nov. Plate XXXIV.—1.

Larva not observed.

Pupa-case dark-orange, with two broad lateral longitudinal bands of dark-brown, which do not touch the margin, and which denote the enclosed insect. Form roundly elliptical, the cephalic extremity sometimes slightly depressed; dorsum slightly convex; abdominal segments moderately distinct. Length about $\frac{1}{20}$in. The dorsum bears, some distance within the margin, a series of twenty-two tubercular pores, glands, or spinneret orifices. Of these, four on the extreme cephalic region are small, with simple circular orifices; the next two (one on each side), on a level with the rostrum, are large and conspicuous, consisting of a cylindrical tube with wide circular orifice; the next four (two on each side) on the median thoracic region are rather small, but larger than the anterior cephalic ones, and have circular multilocular orifices; the next eight (four on each side) on the abdominal region are similar to the two large ones near the rostrum; the last four (two on each side) near the abdominal extremity are about equal in size to the four on the cephalic region, and are simple. The margin is very finely striated, but not crenulated; and for some distance within it the dorsum

is covered with great numbers of very small simple circular spinneret-orifices, but these do not extend to the median dorsal regions. There is no fringe, properly speaking, but all the organs just described produce secretion, as noticed presently. Vasiform orifice rather broader than long, the anterior edge slightly concave, the posterior edge broadly convex; operculum small, covering about one-third of the orifice, with both edges concave, the anterior very deeply, the posterior less, depressed; lingula very long, extending some distance from the orifice, roundly conical, with two rather long setæ near its end.

The spinneret tubes and orifices above mentioned secrete a large quantity of snow-white waxy threads closely felted, and also, scattered amongst these, several long straight glassy rods, which are very brittle; these rods, when closely examined, are seen to be very delicately fluted. The threads appear to be produced from the very numerous minute spinnerets, and the rods from the rows of larger tubes. It results from the absence of small spinnerets on the median dorsal regions that the pupa-case in those parts is uncovered; consequently, it appears as if lying on a thick ring or cushion of cotton, from which fact I have derived its specific name.

On turning over the pupa-case and dissolving the waxy matter, the rudimentary feet and antennæ are clearly visible; the feet are thick and short, the antennæ rather long, slender, and in the latest stage numerously ringed.

Adult form unknown; but from the appearance of the rudimentary wings in a late pupa examined, which was almost on the point of emerging when it died, I believe that the fore-wings will be dark and banded with dark-brown, or perhaps black.

Hab. In Trinidad, West Indies. My specimens were sent by Mr. F. W. Urich. I think the plant is *Jatropha* sp.

It has been necessary to be particular in describing and figuring the details of spinnerets, &c., in this species, on account of its similarity in some respects to three West Indian insects: *Aleurodicus anonæ*, Douglas and Morgan; *A. cocois*, Curtis; and *A. ornatus*, Cockerell. I have already, in my introductory remarks, mentioned that these and other authors employ frequently the term "larva" to denote indiscriminately what I take to be both the larval and the pupal states. Now, first, as to colour: the "larva" of *A. anonæ* is said to be "ochreous"; that of *A. cocois* (as far as I can make out) is similar; that of *A. ornatus* is "grey." No author mentions dark longitudinal brown bands, such as those which are so conspicuous in *A. pulvinata*. What is much more important, in *A. anonæ* Mr. Morgan gives fourteen "lateral infundibuliform compound spinnerets" and "secreting glands"; *A. cocois*

(ap. Riley and Howard) has also fourteen; *A. ornatus* has glands "practically as in *A. anonæ*"; but in *A. pulvinata* there are twenty-two of these organs. No author mentions minute dorsal spinnerets within the margin, such as those which are so extremely numerous in *A. pulvinata;* yet, as these appear to be certainly the producers of the ring of waxy threads, they are of importance. As regards the vasiform orifice and lingula, I find those of *A. anonæ* (which Mr. Morgan curiously terms the "anus, colon, and ilium") and those of *A. cocois* not greatly dissimilar; in fact, they may be said to be practically identical. These organs are not mentioned for *A. ornatus.* In the figure 41B of *A. cocois* (Ins. Life, 1893, p. 314) the lingula of the adult female is shown as protruding considerably from the abdomen; probably this will also be the case in *A. pulvinata.*

I believe that the wings of *A. pulvinata* will be not far removed from the darkly-banded ones of *A. ornatus;* but in the face of the statement that the "larva" of that species is "grey," and in the absence of any further information, I shall not at present so identify the insect, nor shall I yet relegate it to the genus *Aleurodicus.*

49. **Aleurodes quercûs,** Signoret. Ann. de la Soc. Entom. de France, Dec., 1867, p. 384.

50. **Aleurodes ribium,** Douglas. Ent. Mo. Mag., 1888, p. 265; 1889, p. 256.

51. **Aleurodes rubi,** Signoret. Ann. de la Soc. Ent. de France, Dec., 1867, p. 382.

52. **Aleurodes rubicola,** Douglas. Ent. Mo. Mag., 1891, p. 322.

53. **Aleurodes sacchari,** Maskell. Trans. N.Z. Inst., 1889, p. 171.

The vasiform orifice of this species is situated on a projecting tubercle; it is broader than long, with slightly concave anterior edge; operculum covering nearly all the orifice; lingula obsolete.

54. **Aleurodes simplex,** Maskell. Trans. N.Z. Inst., 1889, p. 175.

The vasiform orifice in the pupa is elongate, subconical, with nearly straight anterior edge; operculum small, scarcely covering a fourth of the orifice; lingula extending a short distance beyond the operculum, but not reaching the edge of the orifice, cylindrical, with the extremity slightly dilated and emarginate.

The adult (unknown in 1889) is pale-yellow all over; the

wings are entirely immaculate, with minutely serrated margins. Genitalia normal.

The abdominal cleft and emarginate lingula of this species (especially the former) will distinguish it from *A. rubicola*.

55. **Aleurodes stellata,** Maskell, sp. nov. Plate XXXIV.—2.

Larva light-brown, elliptical, flat; length about $\frac{1}{65}$in. Margin minutely crenulated, but without a fringe.

Pupa-case dark-brown, sometimes black; elliptical; very slightly convex, with a median longitudinal ridge; length about $\frac{1}{30}$in. Abdominal segments indistinct. Dorsum covered with white meal, which frequently becomes rather thick and solid; this meal is secreted by dorsal pores, which it is not easy to make out on account of the blackness of the case; there seem to be two large ones on the cephalic region and two on the thoracic, also four smaller on the abdomen, and the whole dorsum is marked with very numerous minute dots, which may be orifices of spinnerets. The margin is conspicuously crenulated, and bears a long fringe of white waxy tubes, which become agglomerated into almost a solid plate; these tubes are longer in some places than in others, so that the fringe presents the appearance of a star with usually about eight rays. Vasiform orifice small, roundly subconical, the anterior edge straight; operculum subsemicircular, covering about half the orifice; lingula obsolete.

Adult form unknown.

Hab. In Jamaica, on *Lignum vitæ*, in company with *A. floccosa*. Specimens from Mr. Cockerell.

56. **Aleurodes spirææ,** Douglas. Ent. Mo. Mag., 1894, pp. 73, 154.

57. **Aleurodes stypheliæ,** Maskell, sp. nov. Plate XXXV.—1.

Eggs oval, yellow.

Larva very dark-brown; elliptical, flattish; abdominal segments distinct; length about $\frac{1}{80}$in. Dorsum bearing a few hairs. Margin very conspicuously striated and crenulated, with scarcely any, if any, fringe. When the larval exuviæ are attached to the pupa-case the anterior edge is recurved, giving the larva a truncate appearance.

Pupa-case very dark-brown, or glossy-black; elliptical, with the abdomen rather tapering; length about $\frac{1}{40}$in. Dorsum convex, with a median longitudinal ridge, and distinct abdominal segments. On the dorsum there are two long spiny hairs situated on the centre of the thoracic region; and there are also some very minute pores in two rows on the abdominal segments; from these pores is secreted some scanty and fragmentary white meal. Margin very conspicuously tubular and crenulated, and bearing a fringe of white

waxy tubes, which are frequently as long as the breadth of the pupa-case. The larval exuviæ are almost always attached to the pupal dorsum by the two long hairs of the latter. Vasiform orifice with a concave anterior edge, the sides and end broadly rounded; operculum large, with emarginate sides, almost covering the whole orifice; lingula apparently obsolete.

Adult form unknown.

Hab. In Australia, on *Styphelia (Monotoca) richei*. My specimens were sent by Mr. C. French, from Melbourne, and by Mr. Froggatt, from Sydney.

58. **Aleurodes T-signata,** Maskell, sp. nov. Plate XXXV.—2.

Larva very dark-brown, or to the naked eye quite black; elliptical; dorsum convex, with a longitudinal raised ridge and distinct abdominal segments; length about $\frac{1}{50}$in. The dorsum bears twenty-four large, thick spines, with blunt rounded ends—eight (in two transverse rows) on the cephalic region, four on the thoracic region, and twelve (in two longitudinal rows) on the abdomen; between the four on the thorax are four smaller ones on the median region. These spines bear short curling tubes of white wax. Margin deeply crenulated, and bearing a short fragmentary white fringe.

Pupa-case intense glossy black; elliptical; dorsum convex, with a median longitudinal ridge, which is broader and thicker than that of the larva; length about $\frac{1}{26}$in. The cephalic extremity is very frequently acuminate. Dorsum bearing large spines which are arranged somewhat differently from those of the larva, those on the cephalic region forming a submarginal series instead of transverse rows. There are also more numerous small spinnerets—eight on the cephalic region, six on the thoracic, twelve on the abdomen, and two close to the vasiform orifice; besides which, on the centre of the first abdominal segment, there are two large spines. There are thus forty-eight spinnerets (large and small) on the pupa, instead of twenty-eight as in the larva. Margin very conspicuously and deeply crenulated, and bearing a fringe of white waxy tubes, usually of some length, but the fringe is often fragmentary and sometimes quite broken off. Vasiform orifice small, subsemicircular; operculum small, covering half the orifice; lingula obsolete. At the abdominal extremity there are two moderately long hairs, and these hairs frequently carry a pencil of white wax longer than the fringe.

The pupa, when extracted from its case, is yellow, with the divisions of the thorax and abdomen marked by darker colour; the wings, eyes, feet, and antennæ partly developed, the eyes reniform, dark-brown; the whole is enclosed in a very thin translucent membrane which lines the pupa-case.

Adult of normal form. The head and thorax are dark-brown, patched with yellow; the abdomen is yellow, with the genitalia and the dorsal cornicle brown; feet and antennæ brownish-yellow. Antennæ normal, with seven joints. Feet long and slender; claws normal. Forewings exhibiting four light-crimson patches—one small rhomboidal patch close to the anterior margin at about half its length; a second, subrectangular, near the point of curvature of the anterior margin; a third, of irregular shape, opposite the second, but not touching the posterior margin; and a fourth, broadly T-shaped, the base of the T springing from the posterior margin at its most concave point. Genitalia of female sharply conical; genitalia of male not observed. In the dorsal cornicle the lingula does not protrude, and is probably obsolete, as in the pupa.

Hab. In Australia, on *Acacia longifolia*. My specimens were sent by Mr. Froggatt, from Botany, near Sydney.

The very thick and strong spines of the larva and pupa distinguish this species from *A. banksiæ*, in which they are much more slender, though somewhat similarly arranged.

59. **Aleurodes tinæoides** (*auctor ?*). Signoret, Ann. de la Soc. Ent. de France, Dec., 1867, p. 399.

60. **Aleurodes vaccinii,** Künow. Entom. Nachricht., 1880, vi., p. 46; Douglas, Ent. Mo. Mag., 1880, p. 89; *ib.*, 1889, p. 256.

61. **Aleurodes vaporariorum,** Westwood. Gard. Chron., 1856, p. 852; Frauenfeld, Verh. der Zool.-Bot. Gesellsch., Wien, 1867, p. 798; Signoret, Ann. de la Soc. Ent. de France, Dec., 1867, p. 387; Douglas, Ent. Mo. Mag., 1886, p. 164.

62. **Aleurodes xylostei,** Westhoff. Jahresber. Zool. Westfäl. Verein, 1886, p. 56; Karsch, Entom. Nachricht., 1888, xiv., p. 31.

Genus Aleurodicus, Douglas and Morgan.

General characters of *Aleurodes;* vein of forewing branched a second time near its extremity.

In the diagnosis of this genus Mr. Morgan (Ent. Mo. Mag., 1892, p. 31) states that the structure of the genital organs of the male is "different from any species of the genus *Aleurodes*." I have been unable to detect any such difference. Under *A. anonæ* the genitalia of the male are said to be "in form of a forceps, between which lies the penis," and are so figured (*loc. cit.*, plate i., fig 4). Signoret, in his generic characters of *Aleurodes*, says, "Extremity of the male ab-

domen ending in an organ formed like a forceps" (p. 378). And in all the species which I have seen this feature is quite constant, as shown in the figures attached to this paper. I cannot therefore include this amongst the generic characters of *Aleurodicus*.

In a note to the same diagnosis (*loc. cit.*, p. 32) Mr. Douglas says further that *Aleurodicus* differs from *Aleurodes* "in the characteristics of the larva." But nothing is given in the description of the text which is any more than a *specific* difference, and I cannot see how the larva is to be employed for *generic* purposes.

The doubly-branched nervure is, however, a sufficient character for separation.

1. **Aleurodicus anonæ**, Douglas and Morgan. Ent. Mo. Mag., 1892, vol. xxviii., p. 32.

2. **Aleurodicus asarumis**, Shimer. Trans. Amer. Entom. Soc., vol. i., p. 281.

This species is here placed in the genus *Aleurodicus* on the authority of Messrs. Riley and Howard, *Insect Life*, 1893, p. 219.

3. **Aleurodicus cocois**, Curtis. *Aleurodes cocois*, Curtis, Gard. Chron., 1846, p. 284; Signoret, Ann. de la Soc. Ent. de France, 1867–68, p. 398; *Aleurodicus*, Douglas and Morgan, Ent. Mo. Mag., 1892, p. 32; Riley and Howard, *Insect Life*, 1893, p. 314.

4. **Aleurodicus ornatus**, Cockerell. Ent. Mo. Mag., 1893, p. 105.

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Plate XXIV.—1.

Types of details; greatly magnified.

a. Type of adult *Aleurodes*.
b. Head of adult viewed from above.
c. Head of adult viewed from beneath, showing rostrum and mentum.
d. Head of adult viewed sideways, showing rostrum and mentum.
e. Antenna of adult.
f. Eye of adult.
g. Foot of adult.
h. Last joint of tarsus and claws.

Plate XXIV.—2.

Types of details; greatly magnified.

a. Type of wings of *Aleurodes*.
b. Type of forewing of *Aleurodicus*.
c, *d*, *e*, *f*, types of marginal serrations of wings: *c*, *A. asplenii*; *d*, *A. piperis*; *e*, *A. asparagi*; *f*, *A. T-signata*.

g. Vasiform orifice, operculum, and lingula, normal form with retracted lingula.
h. Vasiform orifice seen from the side, lingula retracted.
k. Vasiform orifice seen from the side, lingula extended.
l. Type of female genitalia seen from above.
m. Type of female genitalia seen from the side.
n. Male genitalia (*A. asplenii*) seen from above.
o. Male genitalia (*A. comata*) seen from above.
p. Type of male genitalia, seen from the side.

PLATE XXV.—1.

Aleurodes banksiæ.

a. Larvæ and pupæ on leaf.
b. Diagram of larva, showing arrangement of spines.
c. Spine of larva, more highly magnified.
d. Vasiform orifice and operculum (diagram).
e. Margin of larva.
f. Pupa-case, dorsal view.

PLATE XXV.—2.

Aleurodes barodensis.

a. Larvæ, pupæ, and eggs, on leaf, enlarged.
b. Larva, dorsal view.
c. Diagram of larva, showing arrangement of pores.
d. Margin of larva and pupa.
e. Vasiform orifice, operculum, and lingula.

PLATE XXVI.—1.

Aleurodes cerata.

a. Larvæ and pupæ on leaf.
b. Pupa-case, dorsal view, enlarged.
c. Diagram of pupa-case, showing pores.
d. Margin of larva and pupa.
e. Vasiform orifice, operculum, and lingula (diagram).

PLATE XXVI.—2.

Aleurodes comata.

a. Larvæ and pupæ on leaf.
b. Diagram of larva, showing hairs.
c. Margin of larva.
d. Pupa case, showing enclosed insect.
e. Margin of pupa-case.
f. Vasiform orifice and operculum (diagram).
g. Forewing of adult.
h. Margin of wing of adult.
k. Genitalia of adult male (diagram).

PLATE XXVII.—1.

Aleurodes cotesii.

a. Larvæ and pupæ on leaf.
b. Larva, dorsal view, enlarged.
c. Margin and dorsal pores of larva.
d. Pupa-case, dorsal view, enlarged.
e. Margin of pupa-case.
f. Pupa-case, side view.
g. Vasiform orifice, operculum, and lingula (diagram).

Plate XXVII.—2.

Aleurodes croceata.

a. Pupæ on leaf.
b. Diagram of larva, showing spines.
c. Pupa-case, dorsal view.
d. Margin of pupa-case.
e. Vasiform orifice, operculum, and lingula (diagram).

Plate XXVIII.—1.

Aleurodes decipiens.

a. Larvæ and pupæ on leaf.
b. Larva, dorsal view.
c. Margin of larva.
d. Vasiform orfice, operculum, and lingula of larva (diagram).
e. Pupa-case (?), dorsal view.
f. Abdominal extremity of pupa-case (semi-diagram).

Plate XXVIII.—2.

Aleurodes erigerontis.

a. Pupæ on leaf.
b. Pupa-case, dorsal view.
c. Margin of pupa-case.
d. Diagram of pupa-case, showing papillæ and pores.
e. Vasiform orifice, operculum, and lingula (diagram).
f. Eye of pupa, after treatment, side view.

Plate XXIX.—1.

Aleurodes eugeniæ.

a. Pupæ on leaf.
b. Pupa-case, showing enclosed insect.
c. Diagram of pupa-case, showing radiating patches.
d. One of the radiating patches, enlarged.
e. Margin of pupa-case.
f. Vasiform orifice, operculum, and lingula (diagram).

Plate XXIX.—2.

Aleurodes eugeniæ, var. *aurantii.*

a. Pupæ on leaf.
b. Pupa-case, showing enclosed insect.
c. Diagram of pupa-case, showing radiating patches.
d. One of the radiating patches, enlarged.
e. Margin of pupa-case.
f. Vasiform orifice, operculum, and lingula (diagram).

Plate XXX.—1.

Aleurodes floccosa.

a. Larvæ and pupæ on leaf.
b. Diagram of larva, showing spines.
c. Lanceolate spines of larva, enlarged.
d. Pupa-case with attached larva, dorsal view.
e. Dorsal spines of pupa-case, enlarged.
f. Margin of pupa-case.
g. Vasiform orifice and operculum (diagram).

PLATE XXX.—2.

Aleurodes fodiens.

a. Pupæ on leaf.
b. Pupa in pit on under-surface of leaf.
c. Elevation on upper surface of leaf.
d. Pupa-case, showing enclosed insect.
e. Margin of pupa-case.
f. Vasiform orifice, operculum, and lingula (diagram).

PLATE XXXI.—1.

Aleurodes hirsuta.

a. Larvæ and pupæ on leaf.
b. Diagram of larva, showing arrangement of spines.
c. Diagram of pupa-case, showing arrangement of spines.
d. Spine of pupa-case, enlarged.
e. Margin of pupa-case.
f. Vasiform orifice and operculum (diagram).

PLATE XXXI.—2.

Aleurodes holmesii.

a. Larvæ and pupæ on leaf.
b. Pupa-cases, dorsal and side views.
c. Diagram of pupa-case, showing spines.
d. Margin of pupa-case.
e. Vasiform orifice, operculum, and lingula (diagram).
f. Extremity of lingula, enlarged.

PLATE XXXII.—1.

Aleurodes limbata.

a. Larvæ and pupæ on leaf.
b. Pupa-case with attached larval exuviæ.
c. Margin of pupa-case.
d. Vasiform orifice and operculum (diagram).

PLATE XXXII.—2.

Aleurodes nicotianæ.

a. Larvæ and pupæ on leaf.
b. Diagram of larva, showing depressions and marginal hairs.
c. Pupa-case, dorsal view.
d. Diagram of pupa-case, showing pustules.
e. Margin of pupa-case, with pustules.
f. Vasiform orifice, operculum, and lingula (diagram).

PLATE XXXIII.—1.

Aleurodes niger.

a. Pupæ on leaf.
b. Pupa-case, dorsal view.
c. Margin of pupa-case.
d. Vasiform orifice and operculum (diagram).

PLATE XXXIII.—2.

Aleurodes piperis.

a. Larvæ and pupæ on leaf.
b. Pupa-case, dorsal view, with attached larval exuviæ.
c. Margin of pupa-case.

d. Vasiform orifice, operculum, and lingula (diagram).
e. Pupa extracted from case, dorsal view.
f. Forewing of adult.

PLATE XXXIV.—1.

Aleurodes pulvinata.

a. Pupæ on leaf.
b. Pupa-case, dorsal view.
c. Pupa-case, ventral view, showing enclosed insect.
d. Diagram of pupa-case, showing arrangement of pores.
e. Margin of pupa-case, showing dorsal spinnerets.
f. Vasiform orifice, operculum, and lingula (diagram).

PLATE XXXIV.—2.

Aleurodes stellata.

a. Larvæ and pupæ on leaf.
b. Pupa-case, dorsal view.
c. Margin of pupa-case.
d. Vasiform orifice and operculum (diagram).

PLATE XXXV.—1.

Aleurodes stypheliæ.

a. Larvæ and pupæ on leaf.
b. Pupa-case, dorsal view, showing attached larval exuviæ.
c. Margin of pupa-case.
d. Vasiform orifice and operculum.

PLATE XXXV.—2.

Aleurodes T-signata.

a. Larvæ and pupæ on leaf.
b. Diagram of larva, showing arrangement of spines.
c. One spine of larva, enlarged.
d. Pupa case, dorsal view.
e. Margin of pupa-case.
f. Pupa extracted from case, dorsal view.
g. Forewing of adult.

ART. XL.—*Zoological Notes, Nelson District.*

By R. I. KINGSLEY.

[*Read before the Nelson Philosophical Society, 13th January, 1896.*]

Eurystomus pacificus (Australian Roller).

The first-recorded occurrence of this bird in New Zealand, according to Sir Walter Buller, was in 1881, when Mr. F. E. Clarke reported it in a paper read before the Westland Institute (*vide* Trans. N.Z. Inst., vol. xiii., p. 454); and about the same time four other specimens were obtained in three other places, making altogether five specimens. The localities were far apart, but all situate on the west coast of the two Islands.